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**Carson et al.**

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(54) **AUTOMATIC IDENTITY MANAGEMENT WITH THIRD PARTY SERVICE PROVIDERS**

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**G06F 21/00** (2013.01)  
**H04L 9/40** (2022.01)

(52) **U.S. Cl.**  
CPC ..... **H04L 63/083** (2013.01); **H04L 63/0884** (2013.01); **H04L 63/102** (2013.01); **H04L 2463/082** (2013.01)

(58) **Field of Classification Search**  
CPC ... H04L 63/0884; H04L 63/102; H04L 63/08; H04L 63/083; H04L 2463/082  
See application file for complete search history.

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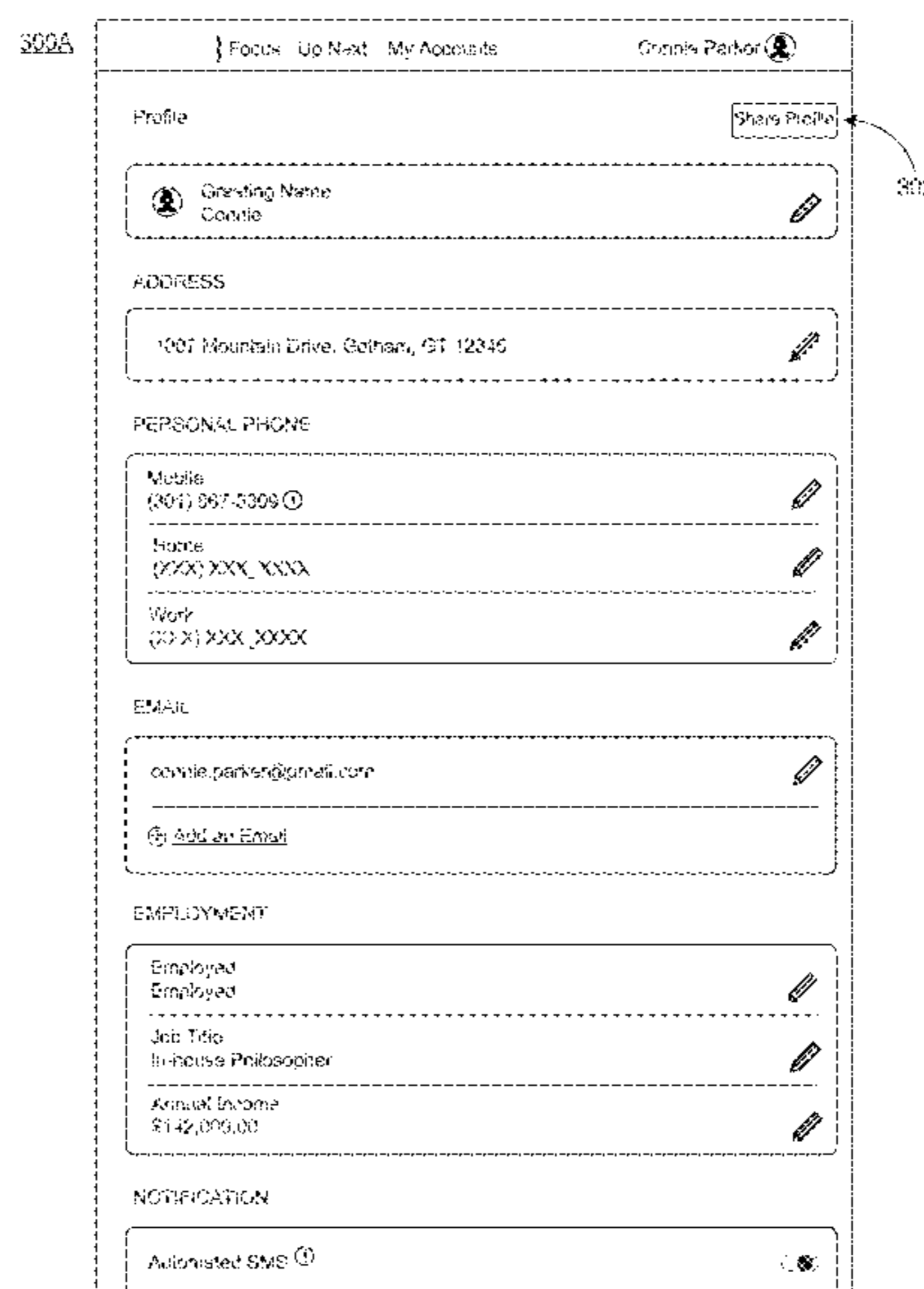
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(57) **ABSTRACT**

Disclosed herein are system, method, and computer program product embodiments for updating identification information of a user with service providers. An embodiment operates by a computing device sending a first piece of identification information describing a user to a service provider requiring a credential to update a user profile unique to the user. Upon receiving an indication that the piece of identification information sufficiently describes the user, the computing device generates an identifier unique to the particular user to identify the user when the computing device communicates with the service provider. Thereafter, the computing device sends an instruction to the service provider to update their user profile with a second piece of identification information. With the request, the computing device sends the identifier unique to the user, which allows the service provider to bypass the user credential and update the user profile with the second piece of identification information.

**20 Claims, 9 Drawing Sheets**



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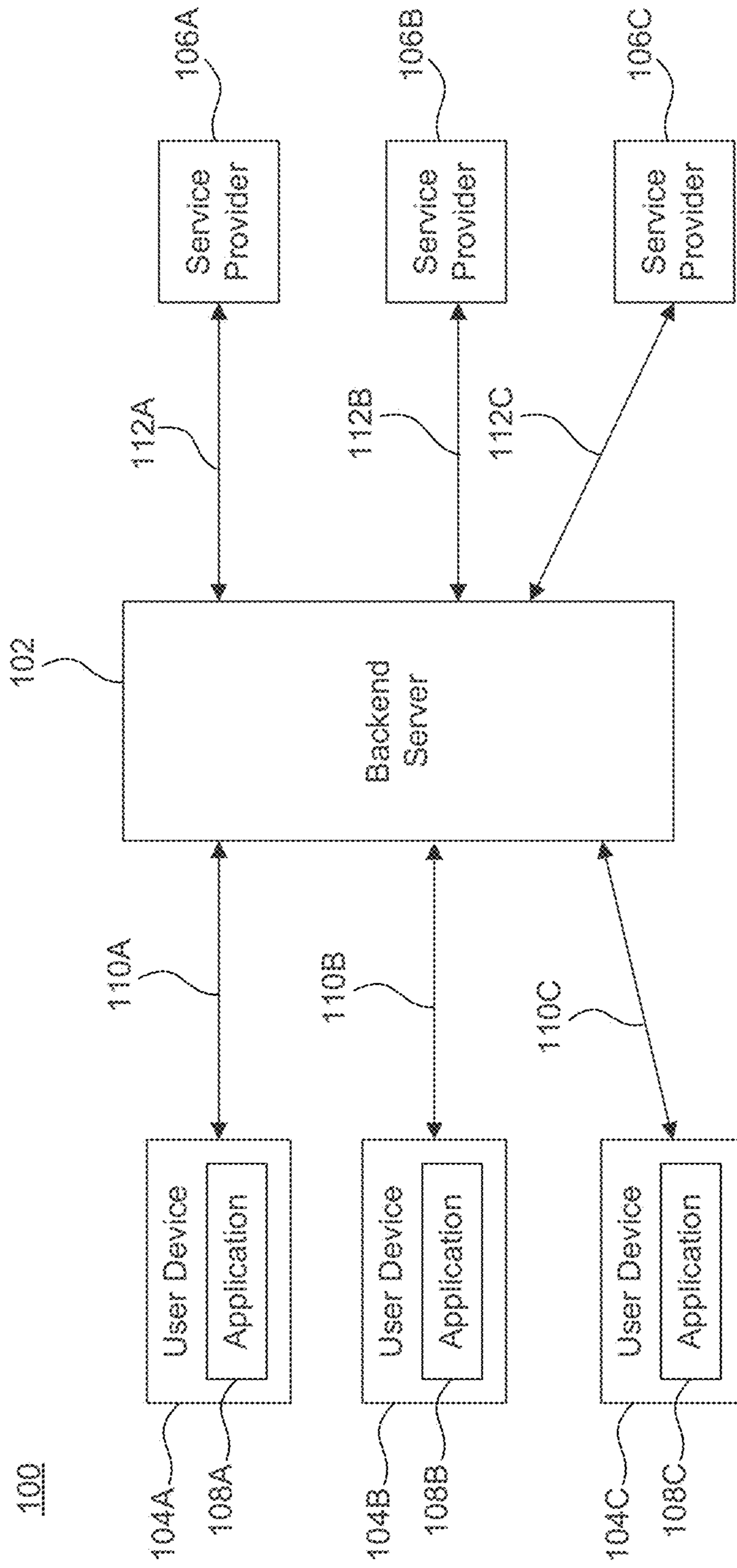


FIG. 1

200A

Backend Server

	204A	204B	204C	204D	204E	204F	204G	206	208
	First Name	Middle Name	Last Name	Email Address	Phone Number	Account Number	Social Security Number	First Unique ID #	Second Unique ID #
202A	Charles	Luke	Smith		111-222-3333	A1A	111-11-1111	4AAA	4BBB
202B	Edmond		Geposchkin	edmond.g@hotmail.com	222-333-4444	B1B	222-22-2222	5AAA	
202C	Caroline	Anna	Herschel	c.anna@gmail.com		B1C	333-33-3333	6AAA	6BBB

FIG. 2A


200B

Service Provider

	204A	204B	204C	204E	204H	204I	210	208
	First Name	Middle Name	Last Name	Phone Number	City, State	Account Number	First Unique ID #	Second Unique ID #
202A	Charles		Smith		Detroit, MI	1A1	4DDD	4BBB
202B	Edmond		Gapsoschkin		Indianapolis, IN	1B1	4DDD	
202C	Caroline		Herschel	333-444-5555	Washington, DC	1C1	6DDD	6BBB



FIG. 2B

300A


| Focus Up Next My Accounts Connie Parker  v

---



Profile Share Profile

 Greeting Name  
Connie 


ADDRESS

1007 Mountain Drive, Gotham, GT 12345 


PERSONAL PHONE

Mobile  
(301) 867-5309  


---

Home  
(XXX) XXX\_XXXX 


---

Work  
(XXX) XXX\_XXXX 


EMAIL

connie.parker@gmail.com 


---

 Add an Email


EMPLOYMENT

Employed  
Employed 



---

Job Title  
In-house Philosopher 

---

Annual Income  
\$142,000.00 

NOTIFICATION

Automated SMS  

302

FIG. 3A

300C

×

### What Information Would You Like to Share?

Select which companies you would like to share your most up-to-date profile information with.

<input checked="" type="checkbox"/>	First & Last Name	<input type="checkbox"/>	Address
<input type="checkbox"/>	Mobile Phone	<input checked="" type="checkbox"/>	Home Phone
<input checked="" type="checkbox"/>	Work Phone	<input type="checkbox"/>	Email Address
<input type="checkbox"/>	Employment Status	<input type="checkbox"/>	Job Title
<input type="checkbox"/>	Annual Income		

Continue

300B

×

### Who Would You Like to Share Your Profile With?

Select which companies you would like to share your most up-to-date profile information with.

<input type="checkbox"/>	Hearth Properties	<input type="checkbox"/>	Heelio
<input type="checkbox"/>	Green Energy	<input type="checkbox"/>	Lighthouse Insurance

Continue

FIG. 3C

FIG. 3B

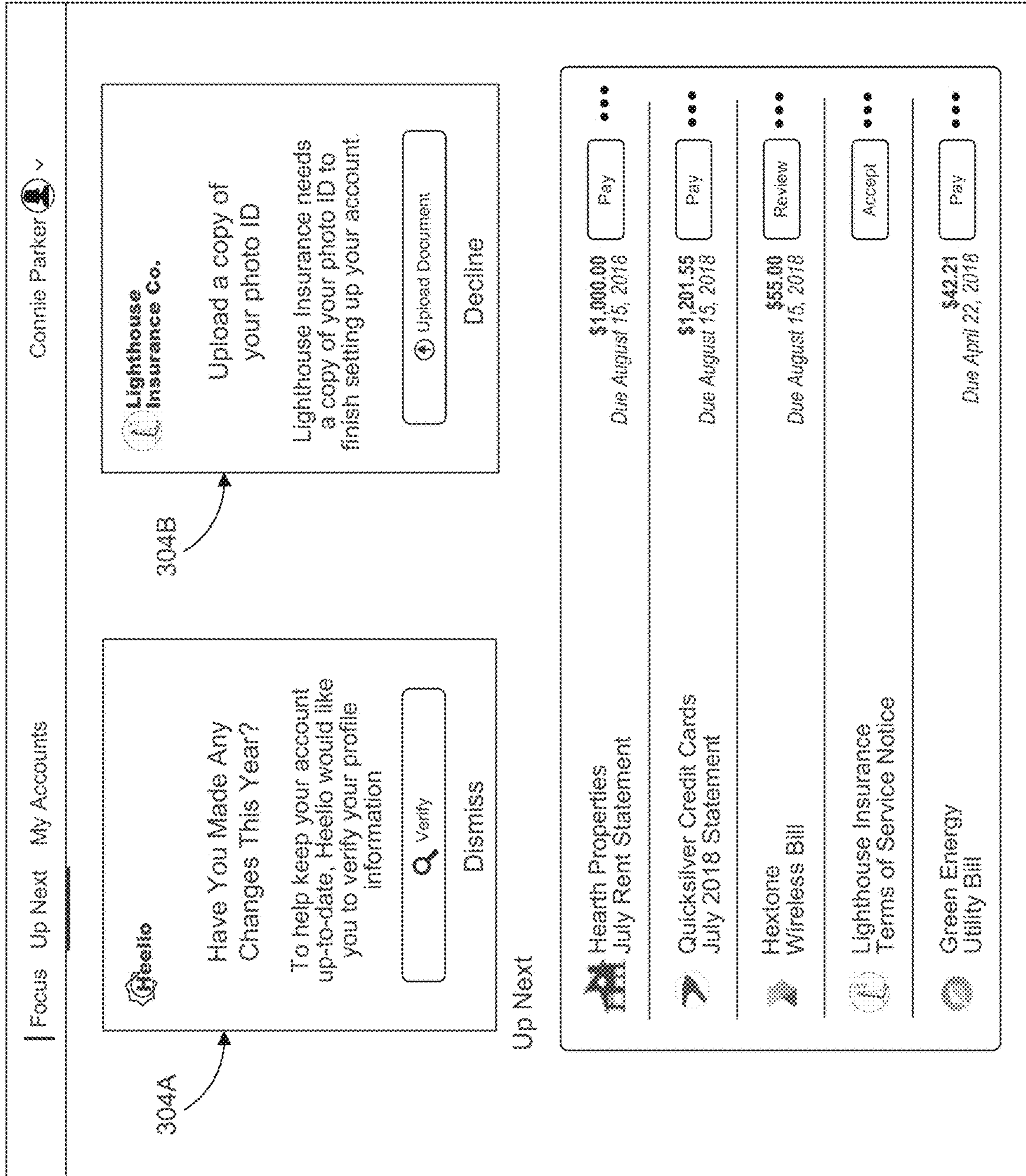


FIG. 3D



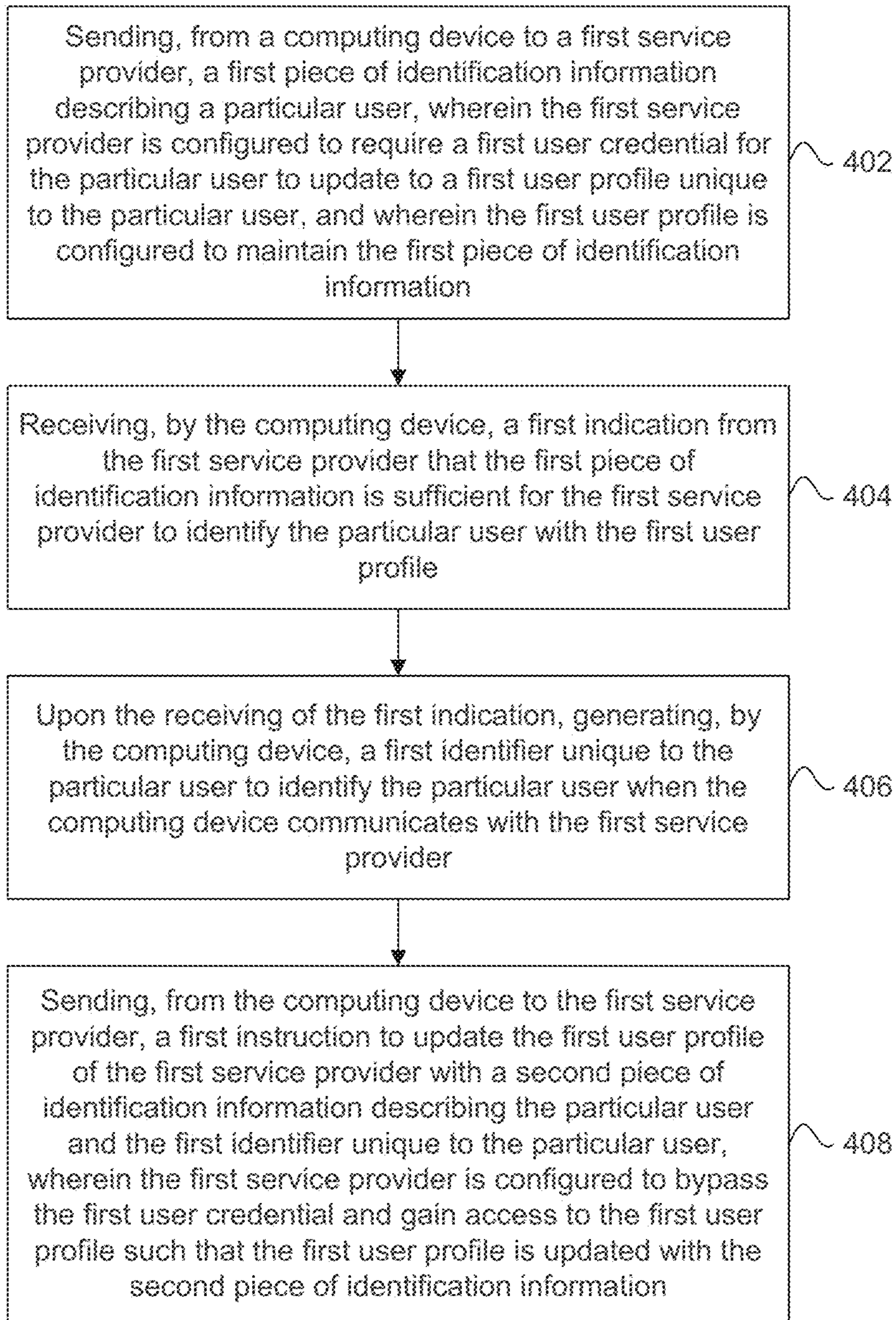


FIG. 4

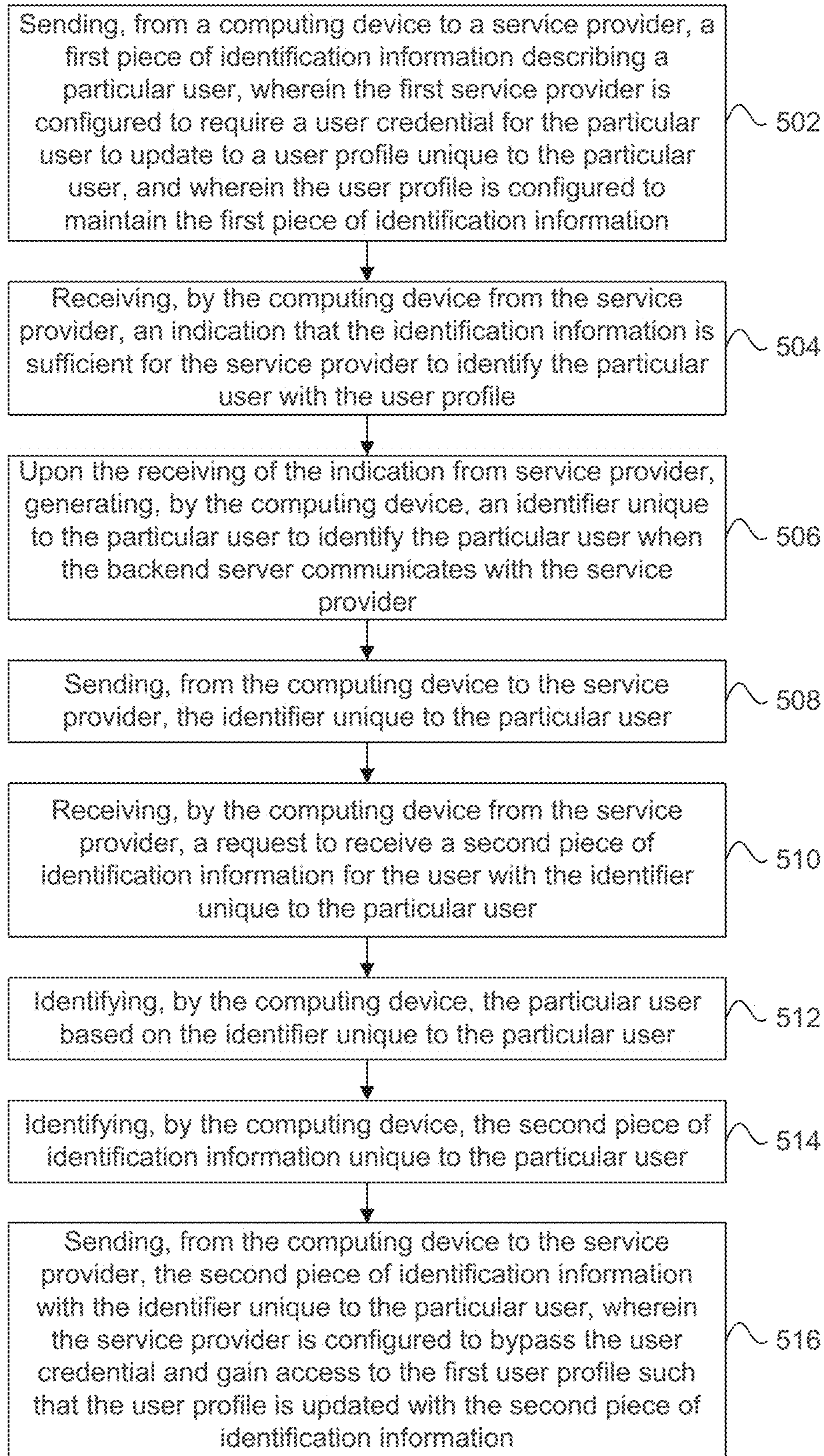


FIG. 5

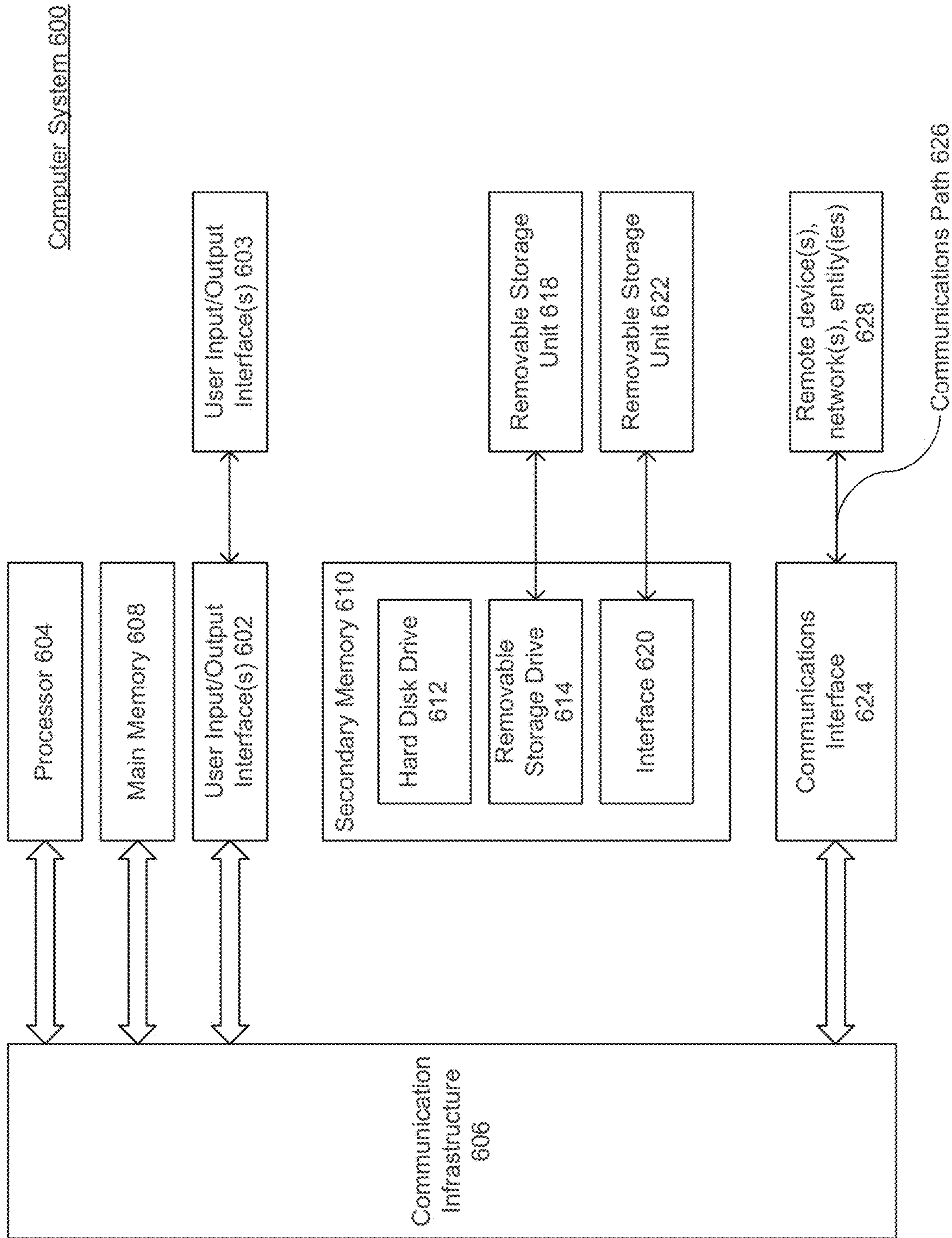


FIG. 6

## AUTOMATIC IDENTITY MANAGEMENT WITH THIRD PARTY SERVICE PROVIDERS

### CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority and is a continuation application of U.S. Ser. No. 16/534,823 filed on Aug. 7, 2019, and titled "Automatic Identity Management with Third Party Service Providers," which is incorporated herein by reference.

### BACKGROUND

Service providers are increasingly providing online services for users. For example, Netflix provides an online service that permits users to stream movies and television programs. Likewise, Amazon provides an online service that permits users to purchase goods, Facebook provides an online service that permits users to network socially, and banking institutions provide online services that permit users to perform financial transactions.

To provide services, service providers create user profiles to store identification information of the users. User profiles may include personal data associated with a specific user. As such, identification information may include personal data that is unique to the specific user and assists in identifying the specific user. For example, identification information may include an email address, a primary and secondary residence, a phone number, and a social security number, just to name a few examples. Thus, each service provider may maintain its own independent database of user profiles to store identification information applicable to its service. And the service providers may have different schemas and have different unique identifiers to identify specific users.

Over time, users may need to update identification information for various reasons. For example, a user may have moved to a different residence. Similarly, a user may have changed their phone number or email address. In each of these instances, users may want to update their user profiles for the services that they utilize.

Because users use many service providers, users have many user profiles stored with different service providers. Currently, when users want to update their identification information, they need to update their user profile for each service provider. To update them, the users may need to enter different credentials for each service provider. This can be cumbersome and very time intensive.

### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are incorporated herein and form a part of the specification.

FIG. 1 illustrates a block diagram of a system for automatically updating identification information of a user with service providers, according to some embodiments.

FIGS. 2A and 2B illustrate example data stored in user profiles maintained by a backend server and service provider illustrated in FIG. 1, according to some embodiments.

FIGS. 3A-3D illustrate example user interfaces of a computer application installed on user device illustrated in FIG. 1, according to some embodiments.

FIGS. 4 and 5 illustrate flowcharts of example methods for updating identification information of a user with service providers, according to some embodiments.

FIG. 6 illustrates an example computer system useful for implementing various embodiments.

In the drawings, like reference numbers generally indicate identical or similar elements. Additionally, generally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

### DETAILED DESCRIPTION

Provided herein are system, apparatus, device, method and/or computer program product embodiments, and/or combinations and sub-combinations thereof, for automatically updating identification information of a user with service providers. In an example embodiment, a backend server managed by an entity (e.g., a banking institution) may store a profile unique to a user that includes identification information unique to the user. Backend server may receive a request from a user to update a service provider with identification information. In response, the backend server may send a request to the service provider to update identification information of the user. The request may include a piece of identification information describing the user.

After receiving confirmation from the service provider that the piece of identification information sufficiently describes the user in their profile of the user, the backend server generates an identifier unique to the user to communicate with the service provider with identification information for the user. The backend server may now send updated identification information of the user to the service provider, along with the identifier unique to the user, to the service provider. By receiving the identifier unique to the user, the service provider may bypass any user credentials (e.g., a user name and password) unique to the service provider and automatically update their profile of the user with the updated identification information.

Similarly, when the service provider would like updated identification information of the user, the service provider may send the request for the updated identification information, along with the identifier unique to the user, to the backend server. Based on the identifier unique to the user, the backend server may automatically identify the user and present an option to the user to update identification information with the service provider.

In addition to being more efficient and less cumbersome for the user, embodiments disclosed herein provide various other technical improvements. For example, by the backend server being a trustworthy source, the disclosed embodiments enable a direct and trusted communication between the backend server and the service providers for each user. Along these lines, by generating a unique connection between the backend server and the service providers for each user, the disclosed embodiments allow the backend server and service providers to more quickly identify users and update their profiles with identification information, thereby increasing efficiency. Likewise, the backend server and service providers process fewer requests, and the processed requests do not include internal identifiers unique to the users, thereby decreasing unnecessary processing power/time and storing less stale information.

FIG. 1 illustrates a system 100 for automatically updating identification information of a user with service providers, according to some embodiments. In some embodiments, system 100 may include backend server 102, service providers 106A-C, and user devices 104A-C. Backend server 102 may be managed by an entity (e.g., a banking institution), which may be associated with a wide range of users having accounts (e.g., bank accounts) with the entity. As such, the accounts may be associated with profiles unique to

the users. Thus, backend server **102** may maintain several (e.g., hundreds) profiles unique to users.

Backend server **102**'s profiles may contain identification information unique to the users. Identification information may be determined by backend server **102**, received by service providers **106A-C**, and/or provided by users via user devices **104A-C**. As such, identification information may include any type of information describing the identity of the user. Accordingly, identification information may include a full name, a home address, a work address, a personal email address, a social security number, passport number, a driver's license number, a credit card number, a date of birth, a telephone number, log in credentials (e.g., username and password), a race, a nationality, an ethnicity, and an origin, just to name a few examples.

Backend server **102**'s profiles may also contain identifiers unique to the users ("user identifiers"). Backend server **102** may assign the user identifiers, for example, upon creation of respective user profiles. User identifiers may not be shared with external entities, including user devices **104A-C** and service providers **106A-C**. As such, user identifiers may permit backend server **102** to quickly and efficiently identify particular users.

As will be discussed in more detail below, backend server **102**'s profiles may also contain identifiers unique to the connection between backend server **102** and service providers **106A-C** and to the users ("connection identifiers"). As such, for the same service provider (e.g., service provider **106A**), backend server **102** may have different connection identifiers for each user and for each service provider for a particular user. The connection identifiers may be created by backend server **102**, for example, upon receiving an indication (e.g., a message) from service providers **106A-C** that identification information of a user sent by the backend server **102** to service providers **106A-C** sufficiently describes a user for which service providers maintain a profile. This may allow the backend server **102** to quickly and efficiently identify, not only a connection between the backend server **102** and a particular service provider **106A-C**, but also a particular user having a profile stored at the backend server **102** and the particular service provider **106A-C**.

Backend server **102** may provide computer applications **108A-C** to allow users to wirelessly access and update their profiles. As such, user devices **104A-C** may download and/or store computer application **108A-C** and may thus be in communication with backend server **102** over public communication lines or mediums **110A-C**. User devices **104A-C** may be managed by a different entity from that managing backend server **102**. As such, user devices **104A-C** may be a device belonging to the users (e.g., a mobile phone). User devices **104A-C** may be a personal digital assistant (PDA), a desktop workstation, a laptop or notebook computer, a netbook, a tablet, a smartphone, smartwatch, or any other type of handheld device.

Backend server **102**'s computer applications **108A-C** may permit users to send updated identification information to service providers **106A-C**. The identification information may be saved in backend server **102**'s profile for the user or upon receipt from backend server **102**, sent directly to service providers **106A-C** without saving in the user's profile. In some embodiments, before sending and/or saving updated identification information, backend servers **102** may authenticate the identification information. As such, backend server **102**'s level of authentication of identification information may be greater than that of the service providers **106A-C**.

As such, after receiving a request from a user to send updated identification information to service providers **106A-C**, backend server **102** may send one or more pieces of identification information to the service providers **106A-C** so that service providers **106A-C** can verify storage of a profile corresponding to the user. In doing so, service providers **106A-C** may request additional pieces of identification information to verify the profile of the user. Along these lines, service providers **106A-C** may request an answer to a security question (e.g., provided by the user at service providers). Only after receiving an answer from backend server **102** and confirming that the answer is correct, service providers **106A-C** provide an indication to backend server **102** that the identity information of the user is sufficient. Accordingly, after receiving an indication from service providers **106A-C** that the identity information of the user sent to service providers **106A-C** is sufficient, backend server **102** may send an identifier—unique to communication between the backend server **102** and service providers **106A-C** and to the user ("connection identifiers")—to the service providers **106A-C**. The connection identifier may be sent before or along with the updated identification information.

As noted above, the connection identifier may allow backend server **102** to quickly and efficiently identify, not only a connection between the backend server **102** and a particular service provider **106A-C**, but also a particular user having a profile stored at the backend server **102** and the particular service provider **106A-C**. Accordingly, after creating the connection identifier, backend server **102** may associate the connection identifier with the user. As such, the user may continue to send updated identification information to the particular service provider **106A-C** at later times, and backend server **102** may be able to quickly identify the user and the particular service provider **106A-C** based on the connection identifier.

Backend server **102** may thus be in communication with service providers **106A-C** over private communication lines or mediums **112A-C**. Service providers **106A-C** may be any entity different from the entity managing the backend server **102** that stores profiles of users who also have profiles stored by backend server **102**. As such, service providers **106A-C** profiles for users may contain identification information different and/or the same as identification information contained by corresponding profiles of users maintained by backend server **102**.

In addition to identification information, like backend server **102**, service providers **106A-C** profiles may contain identifiers unique to the users ("user identifiers"). The user identifiers may be provided by the entity managing the service providers **106A-C** and thus be different from the user identifiers provided by the backend server **102**. The service providers **106A-C** user identifiers may not be shared with external entities, including backend server **102** and user devices **104A-C**. The user identifiers may permit service providers **106A-C** to quickly and efficiently identify particular users internally.

Service providers **106A-C** profiles may also contain the connection identifiers generated by backend server **102**. As discussed above, service providers **106A-C** may receive the connection identifiers from backend server **102** after sending an indication (e.g., a message) to backend server **102** that the identification information of a user sent from backend server **102** to service providers **106A-C** sufficiently describes a user for which the service providers **106A-C** maintain a profile. Accordingly, like backend server **102**, the connection iden-

## 5

tifiers may assist service providers 106A-C in identifying users in subsequent messages from backend server 102.

Along these lines, upon receiving the connection identifier from backend server 102, service providers 106A-C may send a request to backend server 102 to receive updated identification information. The request may include the connection identifier so that backend server 102 may quickly and efficiently identify the particular service provider 106A-C and the user associated therewith.

FIGS. 2A and 2B illustrate example data 200A/200B stored in profiles for users 202A-C maintained by backend server 102 and service provider 106A (of FIG. 1).

FIG. 2A illustrates data 200A stored in profiles for users 202A-C maintained by backend server 102 (of FIG. 1). As illustrated, backend server 102 may store identification information 204A-G for users 202A-C in their respective profiles. As such, for users 202A-C, backend server 102 may store different identification information 204A-G. For example, for user 202A, backend server 102 may store identification information 204A-C/204E-G. In contrast, for user 202B, backend server 102 may store identification information 204A/204C-G and, for user 202C, backend server 102 may store identification information 204A-D/204F-G.

Data 200A stored in profiles for user 202A-C maintained by backend server 102 (of FIG. 1) may also include identifiers 206/208. Upon the creation of the profiles for the users 202A-C, backend server 102 may create and/or assign users 202A-C identifiers 206 unique to the users (“user identifiers”). For example, as illustrated, users 202A-C may be assigned user identifiers “4AAA,” “5AAA,” and “6AA,” respectively. As discussed above, user identifiers 206 may not be shared with service providers 106A-C (of FIG. 1). Rather, user identifiers 206 may solely be used by backend server 102 to identify users 202A-C. As such, by having a single unique identifier associated with users 202A-C, backend server 102 may more quickly and efficiently identify the users 202A-C and their identification information 204A-G.

Likewise, as stated above, upon receiving an indication from service provider 106A that a message sent by backend server 102 sufficiently describes the users 202A-C, backend server 102 may create and/or assign connection identifiers 208 unique to the connection between backend server 102 and service providers 106A-C and to the users (“connection identifiers”). For example, as illustrated, users 202A and 202C may be assigned connection identifiers “4BBB” and “6BBB,” respectively. Connection identifiers 208 may be used by service provider 106A to reference users 202A-C. Thus, for requests from backend server 102 to service provider 106A (or vice versa) to receive updated identification information, connection identifiers 208 may assist identification of the appropriate user. For example, when the backend server 102 sends updated identification information 204B (“Luke”) for user 202A to service provider 106A, backend server 102 may also send unique identifier 208 (“4BBB”) for the connection to service provider 106A with respect to user 202A. This will allow the service provider 106A to quickly and efficiently identify that the updated identification information 204 pertains to user 202A.

Similarly, when backend server 102 receives a request from service provider 106A to update identification information 204F (of FIG. 2A), the service provider 106A may also send connection identifier 208A (“4BBB”) associated with respect to user 202A. This allows backend server 102 and service provider 106A to quickly identify the users for which identification information is sought to be updated.

## 6

FIG. 2B illustrates data 200B stored in profiles of users 202A-C maintained by service provider 106A (of FIG. 1). As shown, for users 202A-C, service provider 106A may store identification information 204A-C/204E/204H-I in the respective profiles. As such, like backend server 102 (of FIG. 1), for users 202A-C, service provider 106A may store different identification information 204A-C/204E/204H-I. For example, for users 202A and 202B, service provider 106A may store identification information 204A/204C/204H-I. And, for user 202C, service provider 106A may store identification information 204A/204C/204E/204H-I.

Along these lines, for users 202A-C, service provider 106A’s (of FIG. 1) may store identification information different from and/or the same as that of backend server 102 (of FIG. 1). For example, for user 202A, service provider 106A and backend server 102 may both store identification information 204A/204C. However, for user 202A, service provider 106A may also store identification information 202H-I, and backend server 102 may also store identification 204E-G.

Data 200B stored in profiles for user 202A-C maintained by service provider 106A (of FIG. 1) may also include identifiers 208/210. Upon the creation of profiles, service providers may create and/or assign identifiers 210 unique to the users (“user identifiers”). User identifiers 210 may be created and/or assigned by the entity managing service provider 106A and may not be shared with backend server 102. Rather, identifiers 210 may solely be used by service provider 106A to identify users 202A-C. As such, by having unique identifiers 210 associated with users 202A-C, service provider 106A may more quickly and efficiently identify the users 202A-C and their identification information 204A-C/204E/204H-I.

As described above, backend server 102 (of FIG. 1) generates identifiers 208 unique to the connection between backend server 102 and service providers 106A (of FIG. 1) and to the users (“connection identifiers”). The service provider 106A may receive a copy of the connection identifiers from the backend server 102 and associate the connection identifiers 208 with the profiles of the corresponding users 202A-C. Accordingly, as illustrated, like the profiles of the users 202A-C maintained by backend server 102, the profiles of users 202A-C maintained by service provider 106A may also include the connection identifiers 208. For example, as illustrated, like backend server 102, service provider 106A may maintain profiles for users 202A and 202C including identifier “4BBB” and “6BBB,” respectively.

FIGS. 3A-D illustrate an example user interfaces 300A-D of a computer application 108A-C provided by backend server 102 and installed on user devices 104A-C (of FIG. 1).

FIGS. 3A-C illustrate example users interfaces 300A-C provided when a user requests identification information be shared with service providers 106A-C (of FIG. 1), FIG. 3A illustrates a user interface 300A permitting a user to provide updated identification information. As noted above, updated identification information may include new identification information never previously received or a change to existing identification information. As such, the user interface 300A may present a user interface element 302 to share updated identification information. Upon selecting the user interface element 302, FIG. 3B illustrates user interface 300B presenting a list of service providers 106A-C to share the identification information therewith. After selecting certain service providers 106A-C, FIG. 3C illustrates user interface 300C presenting the various types of identification information that can be shared with the selected service

providers 106A-C. As illustrated, in some embodiments, certain identification information may not be shared with any service provider 106A-C or with certain service providers 106A-C.

FIG. 3D illustrates a user interface 300D presenting requests 304A-B from service providers 106A-B (of FIG. 1) to receive updated identification information. In some embodiments, the request 304A may include identification information from the service providers 106A-B for the user to confirm that it is up-to-date, in some embodiments, the request 304B may be for receipt of identification information not previously received (e.g., a photo of identification).

FIGS. 4 and 5 illustrate flowcharts of methods 400/500 for updating identification information of a user with service providers, according to some embodiments. Method 400/500 can be performed by processing logic that can comprise hardware (e.g., circuitry, dedicated logic, programmable logic, microcode, etc.), software (e.g., instructions executing on a processing device), or a combination thereof. It is to be appreciated that not all steps may be needed to perform the disclosure provided herein. Further, some of the steps may be performed simultaneously, or in a different order than shown in FIGS. 4 and 5, as will be understood by a person of ordinary skill in the art.

Referring now to FIG. 4, method 400 shall be described with reference to FIG. 1. However, method 400 is not limited to those example embodiments.

In 402, backend server 102 sends a piece of identification information describing a particular user to a service provider 106A. The service provider requires a user credential (e.g., a user name and password unique to the user) for the user to update to a user profile that is unique to the user and maintains the first piece of identification information. In some embodiments, the service provider requires a multi-factor authentication. The multi-factor authentication may include a combination of two different factors including, for example, something they know, something they have, or something they are. For example, the service provider may first request a user credential. After correct entry of the user credential, the service provider may then request a code (numbers and/or letters) sent to their previously-stored email address, texted to their previously-stored mobile phone number or generated by third-party application installed on a registered device.

In some embodiments, a user at user device 104A requests that updated identification information be sent to service provider 106A. As such, the piece of identification information sent to the service provider 106A may be a different piece of identification information to be updated. For example, the piece of identification information sent to the service provider 106A may be an old piece of identification information (as opposed to updated or new).

In 404, backend server 102 receives an indication from the service provider 106A that the identification information is sufficient for the first service provider to identify the particular user with the first user profile.

As such, service provider 106A may determine that the identification information sent by backend server 102 matches stored identification information for the user. In doing so, service provider 106A may determine that the identification information sent by backend server 102 meets or exceeds a predetermined threshold for sufficiently describing the user. For example, the service provider may 106A may initially require at least a first and last name be received from backend server 102. Thus, if backend server 102 sends a first, middle and last name of the user and service provider 106A has only a single user matching the

first and last name of the user, service provider 106A may determine that the threshold has been met. Alternatively, if service provider 106A has multiple users with the first and last name (without the middle name) sent by backend server 102, service provider 106A may require additional identification information.

In 406, upon the receiving of the indication from service provider 106A, backend server 102 generates an identifier unique to the particular user to identify the particular user when the backend server 102 communicates with the service provider 106A. Accordingly, the identifier unique to the particular user may assist the backend server 102 when receiving requests from service provider 106A to receive updated identity information for the user. Likewise, the identifier unique to the particular user may assist service provider 106A when receiving requests to update a piece of identify information stored on service provider 106A.

In 408, backend server 102 receives an instruction to update the user profile of service provider 106A with a second piece of identification information that is different from the first piece of identification information. The instruction includes the identifier unique to the user. As previously stated, the service provider 106A may quickly locate the appropriate user's profile. And, in the process, service provider 106A may bypass the credential associated with the user's profile and update the user's profile with the second piece of identification information.

Referring now to FIG. 5, method 500 shall be described with reference to FIG. 1. However, method 500 is not limited to those example embodiments.

In 502, backend server 102 sends a first piece of identification information describing a particular user to a service provider 106A. The service provider is configured to require a user credential for the particular user to update to a user profile unique to the particular user, and wherein the user profile is configured to maintain the first piece of identification information

In 504, backend server 102 receives an indication that the identification information is sufficient for the service provider to identify the particular user with the user profile from the service provider 106A.

In 506, upon the receiving of the indication from service provider 106A, backend server 102 generates an identifier unique to the particular user to identify the particular user when the backend server 102 communicates with the service provider 106A.

In 508, backend server 102 sends the identifier unique to the particular user to the service provider 106A.

In 510, backend server 102 receives a request from the service provider 106A to receive a second piece of identification information for the user with the identifier unique to the particular user.

In 512, backend server 102 identifies the particular user based on the identifier unique to the particular user.

In 514, backend server 102 identifies the second piece of identification information unique to the particular user.

In 516, backend server 102 sends the second piece of identification information with the identifier unique to the particular user to the service provider 106A. The service provider is configured to bypass the user credential and gain access to the first user profile such that the user profile is updated with the second piece of identification information.

Various embodiments may be implemented, for example, using one or more well-known computer systems, such as computer system 600 shown in FIG. 6. One or more computer systems 600 may be used, for example, to implement

any of the embodiments discussed herein, as well as combinations and sub-combinations thereof.

Computer system **600** may include one or more processors (also called central processing units, or CPUs), such as a processor **604**. Processor **604** may be connected to a communication infrastructure or bus **606**.

Computer system **600** may also include user input/output device(s) **603**, such as monitors, keyboards, pointing devices, etc., which may communicate with communication infrastructure or bus **606** through user input/output interface (s) **602**.

One or more of processors **604** may be a graphics processing unit (GPU). In an embodiment, a GPU may be a processor that is a specialized electronic circuit designed to process mathematically intensive applications. The GPU may have a parallel structure that is efficient for parallel processing of large blocks of data, such as mathematically intensive data common to computer graphics applications, images, videos, etc.

Computer system **600** may also include a main or primary memory **608**, such as random access memory (RAM). Main memory **608** may include one or more levels of cache. Main memory **608** may have stored therein control logic (i.e., computer software) and/or data.

Computer system **600** may also include one or more secondary storage devices or memory **610**. Secondary memory **610** may include, for example, a hard disk drive **612** and/or a removable storage device or drive **614**. Removable storage drive **614** may be a floppy disk drive, a magnetic tape drive, a compact disk drive, an optical storage device, tape backup device, and/or any other storage device/drive.

Removable storage drive **614** may interact with a removable storage unit **618**. Removable storage unit **618** may include a computer-usable or readable storage device having stored thereon computer software (control logic) and/or data. Removable storage unit **618** may be a floppy disk, magnetic tape, compact disk, DVD, optical storage disk, and/or any other computer data storage device. Removable storage drive **614** may read from and/or write to a removable storage unit **618**.

Secondary memory **610** may include other means, devices, components, instrumentalities or other approaches for allowing computer programs and/or other instructions and/or data to be accessed by computer system **600**. Such means, devices, components, instrumentalities or other approaches may include, for example, a removable storage unit **622** and an interface **620**. Examples of the removable storage unit **622** and the interface **620** may include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an EPROM or PROM) and associated socket, a memory stick and USB port, a memory card and associated memory card slot, and/or any other removable storage unit and associated interface.

Computer system **600** may further include a communication or network interface **624**. Communication interface **624** may enable computer system **600** to communicate and interact with any combination of external devices, external networks, external entities, etc. (individually and collectively referenced by reference number **628**). For example, communication interface **624** may allow computer system **600** to communicate with external or remote devices **628** over communications path **626**, which may be wired and/or wireless (or a combination thereof), and which may include any combination of LANs, WANs, the Internet, etc. Control logic and/or data may be transmitted to and from computer system **600** via communication path **626**.

Computer system **600** may also be any of a personal digital assistant (PDA), desktop workstation, laptop or notebook computer, netbook, tablet, smartphone, smartwatch or another wearable, appliance, part of the Internet-of-Things, and/or embedded system, to name a few non-limiting examples, or any combination thereof.

Computer system **600** may be a client or server, accessing or hosting any applications and/or data through any delivery paradigm, including but not limited to remote or distributed cloud computing solutions; local or on-premises software (“on-premise” cloud-based solutions); “as a service” models (e.g., content as a service (CaaS), digital content as a service (DCaaS), software as a service (SaaS), managed software as a service (MSaaS), platform as a service (PaaS), desktop as a service (DaaS), framework as a service (FaaS), backend as a service (BaaS), mobile backend as a service (MBaaS), infrastructure as a service (IaaS), etc.); and/or a hybrid model including any combination of the foregoing examples or other services or delivery paradigms.

Any applicable data structures, file formats, and schemas in computer system **600** may be derived from standards including but not limited to JavaScript Object Notation (JSON), Extensible Markup Language (XML), Yet Another Markup Language (YAML), Extensible Hypertext Markup Language (XHTML), Wireless Markup Language (WML), MessagePack, XML User Interface Language (XUL), or any other functionally similar representations alone or in combination. Alternatively, proprietary data structures, formats, or schemas may be used, either exclusively or in combination with known or open standards.

In some embodiments, a tangible, non-transitory apparatus or article of manufacture comprising a tangible, non-transitory computer useable or readable medium having control logic (software) stored thereon may also be referred to herein as a computer program product or program storage device. This includes, but is not limited to, computer system **600**, main memory **608**, secondary memory **610**; and removable storage units **618** and **622**, as well as tangible articles of manufacture embodying any combination of the foregoing. Such control logic, when executed by one or more data processing devices (such as computer system **600**), may cause such data processing devices to operate as described herein.

Based on the teachings contained in this disclosure; it will be apparent to persons skilled in the relevant art(s) how to make and use embodiments of this disclosure using data processing devices, computer systems and/or computer architectures other than that shown in FIG. **6**. In particular, embodiments can operate with software, hardware, and/or operating system implementations other than those described herein.

It is to be appreciated that the Detailed Description section, and not any other section, is intended to be used to interpret the claims. Other sections can set forth one or more but not all exemplary embodiments as contemplated by the inventor(s), and thus, are not intended to limit this disclosure or the appended claims in any way.

While this disclosure describes exemplary embodiments for exemplary fields and applications, it should be understood that the disclosure is not limited thereto. Other embodiments and modifications thereto are possible and are within the scope and spirit of this disclosure. For example, and without limiting the generality of this paragraph, embodiments are not limited to the software, hardware, firmware, and/or entities illustrated in the figures and/or described herein. Further, embodiments (whether or not



11

explicitly described herein) have significant utility to fields and applications beyond the examples described herein.

Embodiments have been described herein with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries can be defined as long as the specified functions and relationships (or equivalents thereof) are appropriately performed. Also, alternative embodiments can perform functional blocks, steps, operations, methods, etc. using orderings different than those described herein.

References herein to “one embodiment,” “an embodiment,” “an example embodiment,” or similar phrases, indicate that the embodiment described can include a particular feature, structure, or characteristic, but every embodiment can not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it would be within the knowledge of persons skilled in the relevant art(s) to incorporate such feature, structure, or characteristic into other embodiments whether or not explicitly mentioned or described herein. Additionally, some embodiments can be described using the expression “coupled” and “connected” along with their derivatives. These terms are not necessarily intended as synonyms for each other. For example, some embodiments can be described using the terms “connected” and/or “coupled” to indicate that two or more elements are in direct physical or electrical contact with each other. The term “coupled,” however, can also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other.

The breadth and scope of this disclosure should not be limited by any of the above-described exemplary embodiments but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

**1.** A computer-implemented method, comprising:

maintaining, by a first service provider, a first user profile unique to a particular user,

wherein the first user profile comprises a first and second piece of identification information describing the particular user;

sending, from the first service provider to a second service provider, the first piece of identification information describing the particular user, wherein the second service provider maintains a second user profile unique to the particular user and is configured to require a first user credential for the particular user to update the second user profile, and wherein the second user profile comprises the first piece of identification information;

receiving, by the first service provider from the second service provider, a first indication that the second service provider has identified the particular user having the second user profile;

upon the receiving of the first indication, generating, by the first service provider, a first connection identifier unique to the particular user and the second service provider; and

sending, from the first service provider to the second service provider, the first connection identifier for determining that the second piece of identification information relates to the particular user based on the first connection identifier;

12

sending, from the first service provider to the second service provider, a first instruction to update the second user profile with the second piece of identification information,

wherein:

the first instruction includes the first connection identifier,

the second service provider is configured to determine that the second piece of identification information relates to the particular user based on the first connection identifier; and

after determining that the first connection identifier relates to the particular user, the second service provider is configured to bypass the first user credential and gain access to the second user profile such that the second user profile is updated with the second piece of identification information.

**2.** The computer-implemented method of claim **1**, further comprising:

receiving, by the first service provider, the first piece of identification information;

storing, by the first service provider, the first piece of identification information;

authenticating, by the first service provider, the first piece of identification information as being unique to the particular user,

wherein the authentication of the first piece of identification information is prior to the sending of the first piece of identification information to the second service provider.

**3.** The computer-implemented method of claim **2**, wherein the authentication of the first piece of identification information is performed by the first service provider and has an equal or higher level of authentication than an authentication performed by the second service provider on the first piece of identification information.

**4.** The computer-implemented method of claim **1**, wherein the first user credential includes a username and password unique to the particular user.

**5.** The computer-implemented method of claim **1**, wherein the first piece of identification information is not sent with the second piece of identification information and the first connection identifier unique to the particular user to update the second user profile maintained by the second service provider.

**6.** The computer-implemented method of claim **1**, further comprising:

receiving, by the first service provider, a security question from the second service provider; and

sending, from the first service provider to the second service provider, an answer to the security question, wherein:

the second service provider is configured to determine if the answer to the security question is a correct answer, and

the receiving of the first indication from the second service provider is based on the answer to the security question being the correct answer.

**7.** The computer-implemented method of claim **1**, further comprising: generating, by the first service provider, the first connection identifier unique to the particular user based on the first piece of identification information.

**8.** The computer-implemented method of claim **1**, further comprising:

sending, from the first service provider to a third service provider, the first piece of identification information, wherein the third service provider is configured to

13

maintain a third user profile unique to the particular user, and wherein the third user profile is configured to maintain the first piece of identification information; receiving, by the first service provider from the third service provider, a second indication that the first piece of identification information is sufficient for the third service provider to identify the particular user having the third user profile; upon the receiving of the second indication, generating, by the first service provider, a second connection identifier unique to the particular user and the third service provider; sending, from the first service provider to the third service provider, the second connection identifier for determining that identification information relates to the particular user based on the second connection identifier; and associating, by the first service provider, the particular user with the first connection identifier unique to the particular user and the second connection identifier unique to the particular user.

**9.** The computer-implemented method of claim **8**, further comprising:

sending, from the second service provider to the third service provider, a second instruction to update the third user profile with the second piece of identification information, wherein:

the second instruction includes the second connection identifier,

the third service provider is configured to determine that the second piece of identification information relates to the particular user based on the second connection identifier,

the third service provider is configured to require a second user credential for the particular user to update the third user profile, and

the third service provider is configured to bypass the second user credential and gain access to the third user profile such that the third user profile is updated with the second piece of identification information.

**10.** The computer-implemented method of claim **9**, wherein the first user profile further comprises a third piece of identification information describing the particular user, further comprising:

sending, from the first service provider to the third service provider, a third instruction to update the third user profile with the third piece of identification information, wherein the third service provider is configured to bypass the second user credential and gain access to the third user profile such that the third user profile is updated with the third piece of identification information.

**11.** The computer-implemented method of claim **1**, further comprising:

receiving, by the first service provider, a request from the second service provider to receive a third piece of identification information describing the particular user;

receiving, by the first service provider, an authorization from a user to send the third piece of identification information to the second service provider; and

sending, from the first service provider to the second service provider, a fourth instruction to update the second user profile of the second service provider with the third piece of identification information,

14

wherein:

the fourth instruction includes the first connection identifier unique to the particular user, and

the second service provider is configured to bypass the first user credential and gain access to the second user profile such that the second user profile is updated with the third piece of identification information.

**12.** The computer-implemented method of claim **11**, further comprising:

after receiving the request from the second service provider, receiving, by the first service provider, the third piece of identification information from the user.

**13.** The computer-implemented method of claim **1**, wherein the first piece of identification information and the second piece of identification information are a name, a phone number, an email address, a race, a nationality, an ethnicity, an origin, a home address, a work address, a mobile phone number, a home phone number, a primary phone number, a secondary phone number, or an image of the particular user.

**14.** The computer-implemented method of claim **1**, wherein:

the first user profile further comprises a user identifier unique to the particular user associated with the first connection identifier, and

the user identifier is different from the first connection identifier.

**15.** The computer-implemented method of claim **1**, wherein the user identifier is used internally by the first service provider to identify the particular user based on an interaction with the first user profile rather than communicating with the second service provider.

**16.** The computer-implemented method of claim **1**, further comprising:

identifying, by the first service provider, an identification information type of the second piece of identification information;

determining, by the first service provider, that the second piece of identification information can be shared based on the identification information type of the second piece of identification information, wherein the first instruction to update the second user profile of the second service provider is sent after determining that the second piece of identification information can be shared.

**17.** The computer-implemented method of claim **16**, wherein the determining that the second piece of identification information can be shared further comprises:

determining, by the first service provider, that the second piece of identification information can be shared with the second service provider based on an identity of the second service provider.

**18.** The computer-implemented method of claim **1**, further comprising:

receiving, by the first service provider from the second service provider, a fourth piece of identification information describing the particular user and the first connection identifier unique to the particular user;

identifying, by the first service provider, the first user profile of the particular user based on the first connection identifier; and

updating, by the first service provider, the first user profile of the particular user with the fourth piece of identification information.

**19.** A system, comprising:

a memory configured to store operations; and

15

one or more processors configured to perform the operations, the operations comprising:

maintaining, by a first service provider, a first user profile unique to a particular user, wherein the first user profile comprises a first and second piece of identification information describing the particular user;

sending, from the first service provider to a second service provider, the first piece of identification information describing the particular user, wherein the second service provider maintains a second user profile unique to the particular user and is configured to require a user credential for the particular user to update the second user profile, and wherein the second user profile is configured to maintain the first piece of identification information;

receiving, by the first service provider from the second service provider, an indication that the second service provider has identified the particular user having the second user profile;

upon the receiving of the indication, generating, by the first service provider, a first connection identifier unique to the particular user and the second service provider; and

sending, from the first service provider to the second service provider, the first connection identifier for determining that the second piece of identification information relates to the particular user based on the first connection identifier;

sending, from the first service provider to the second service provider, an instruction to update the second user profile with the second piece of identification information,

wherein:

the instruction includes the first connection identifier, the second service provider is configured to determine that the second piece of identification information relates to the particular user based on the first connection identifier; and

after determining that the first connection identifier relates to the particular user, the second service provider is configured to bypass the user credential and gain access to the second user profile such that the second user profile is updated with the second piece of identification information.

16

20. A non-transitory computer-readable storage device having instructions stored thereon, execution of which, by one or more processing devices, causes the one or more processing devices to perform operations comprising:

maintaining, by a first service provider, a first user profile unique to a particular user, wherein the first user profile comprises a first and second piece of identification information describing the particular user;

sending, from the first service provider to a second service provider, the first piece of identification information describing the particular user, wherein the second service provider maintains a second user profile unique to the particular user and is configured to require a user credential for the particular user to update the second user profile, and wherein the second user profile comprises the first piece of identification information;

receiving, by the first service provider, an indication from the second service provider that the second service provider has identified the particular user having the second user profile;

upon the receiving of the indication, generating, by the first service provider, a first connection identifier unique to the particular user and the second service provider; and

sending, from the first service provider to the second service provider, the first connection identifier for determining that the second piece of identification information relates to the particular user based on the first connection identifier;

sending, from the first service provider to the second service provider, an instruction to update the second user profile with the second piece of identification information,

wherein:

the instruction includes the first connection identifier, the second service provider is configured to determine that the second piece of identification information relates to the particular user based on the first connection identifier; and

after determining that the first connection identifier relates to the particular user, the second service provider is configured to bypass the user credential and gain access to the second user profile such that the second user profile is updated with the second piece of identification information.

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